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**C16S-A/AA/CH/CHST/EI/MNG/MET/IT/
TT/PKG/C/CM/EC/EE/M-102**

5102

BOARD DIPLOMA EXAMINATION, (C-16S)

NOVEMBER - 2019

**I SEMESTER (COMMON) EXAMINATION
ENGINEERING MATHEMATICS - I**

Time : 3 Hours]

[Total Marks : 80

PART - A

$2 \times 15 = 30$

- Instructions :**
- (1) Answer any 15 questions.
 - (2) Each question carries 2 marks.
 - (3) Answer should be brief and straight to the point and shall not exceed five simple sentences.

- 1 Find the value of \log_8^{128} .
- 2 Define proper and improper fractions.
- 3 Resolve $\frac{1}{(x-4)(x-9)}$ into partial fractions.
- 4 Define scalar matrix and give one example.
- 5 If $A = \begin{pmatrix} i & 0 \\ 0 & i \end{pmatrix}$, then find A^2 .

6 If $A = \begin{pmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{pmatrix}$, then find $A + A^T$.

7 Define singular and non-singular matrices.

8 Find the inverse of the matrix $\begin{pmatrix} 1 & -1 \\ 0 & 2 \end{pmatrix}$.

9 Write the formulae for $\cos(A+B)$ and $\cos(A-B)$.

10 Find $\cos 15^\circ$. <http://www.sbtetonline.com>

11 Write the formulae for $\sin 2A$ and $\cos 2A$ in terms of $\tan A$.

12 Prove that $\frac{1+\cos 2A}{\sin 2A} = \cot A$.

13 If $\cos A = \frac{4}{5}$, then find $\cos 3A$.

14 Prove that $\cos 70^\circ + \cos 50^\circ - \cos 10^\circ = 0$.

15 Prove that $\tan^{-1}\left(\frac{1}{4}\right) + \tan^{-1}\left(\frac{3}{5}\right) = \frac{\pi}{4}$.

16 State Sine rule.

17 State Projection rule.

18 Define $\sinh x$ and $\cosh x$.

19 If $z = 4 + 5i$, then find $z - \bar{z}$.

20 Find the multiplicative inverse of the complex number $1+i$.

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PART - B

10×5=50

Instructions :

- (1) Answer any **FIVE** questions.
- (2) Each question carries **TEN** marks.
- (3) Answer should be comprehensive and criterion for valuation is the content but not the length of the answer.

21 (a) Resolve $\frac{3}{(x-1)(x+2)^2}$ into partial fractions.

Q6 If $A = \begin{pmatrix} -1 & -2 & 0 \\ 3 & 4 & 5 \\ 1 & 2 & -3 \end{pmatrix}$, $B = \begin{pmatrix} 4 & 4 & 3 \\ 4 & 5 & 2 \\ 2 & 1 & 2 \end{pmatrix}$ and

$C = \begin{pmatrix} -2 & -3 & 1 \\ 3 & 4 & 2 \\ 2 & 1 & 3 \end{pmatrix}$, then show that

$$A(B+C) = AB + AC.$$

22 (a) Solve
$$\begin{vmatrix} x+1 & 3 & 5 \\ 2 & x+2 & 5 \\ 2 & 3 & x+4 \end{vmatrix} = 0$$

(b) Solve the following equations by Guass-Jordan method.

$$x - 2y - z = -1,$$

$$x - y - z = 0,$$

$$2x + 3y + 2z = 5.$$

23 (a) If $A + B = \frac{\pi}{4}$, then prove that $(1 + \tan A)(1 + \tan B) = 2$.

(b) If $\sin A = \frac{3}{5}$, $\cos B = \frac{5}{13}$, then find $(A+B)$.

24 (a) Prove that $\cos 10^\circ \cos 30^\circ \cos 50^\circ \cos 70^\circ = \frac{3}{16}$.

(b) Prove that $\tan 3A - \tan 2A - \tan A = \tan A \tan 2A \tan 3A$.

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25 (a) Prove that $\frac{\sin 7A + \sin 17A}{\cos 7A + \cos 17A} = \tan 12A.$

(b) If $\sin x + \sin y = \frac{3}{4}$ and $\sin x - \sin y = \frac{2}{5}$, then prove
that : $8 \tan\left(\frac{x+y}{2}\right) = 15 \tan\left(\frac{x-y}{2}\right).$

26 (a) In any triangle ABC prove that

$$\cos 2A + \cos 2B - \cos 2C = 1 - 4 \sin A \sin B \cos C.$$

(b) Prove that $\sin^{-1}\left(\frac{4}{5}\right) + \sin^{-1}\left(\frac{5}{13}\right) = \cos^{-1}\left(\frac{16}{65}\right).$

27 (a) If $\tan^{-1}x + \tan^{-1}y + \tan^{-1}z = \frac{\pi}{2}$, then show that
 $xy + yz + zx = 1.$

(b) Solve $\cos^{-1}\left(\frac{1-a^2}{1+a^2}\right) + \sec^{-1}\left(\frac{1+b^2}{1-b^2}\right) = 2 \tan^{-1}x.$

28 (a) Find the real and imaginary parts of the complex

$$\text{number } \left(\frac{1+i}{1-i}\right)^5 - \left(\frac{1-i}{1+i}\right)^5.$$

(b) Express $-1 - \sqrt{3}i$ in polar form.